



PAO:U09-553



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

Net Zero Plus JCTD:  
Evaluation of Energy  
Saving Technologies for  
Expeditionary Shelters

*Brant Lagoon  
Project Lead  
NSRDEC  
Presented to JOCOTAS  
4 November 2009*

UNCLASSIFIED

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>04 NOV 2009</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2009 to 00-00-2009</b>	
4. TITLE AND SUBTITLE <b>Net Zero Plus JCTD: Evaluation of Energy Saving Technologies for Expeditionary Shelters</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Army Research, Development and Engineering Command (RDECOM), Army Natick Soldier RD&amp;E Center, Natick, MA, 01760</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>6th Bi-Annual DOD JOCOTAS Meeting with Rigid &amp; Soft Wall Shelter Industry &amp; Indoor &amp; Outdoor Exhibition, 2-4 Nov 2009, Panama City Beach, FL</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>14</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



# Net Zero + JCTD – NSRDEC Purpose



- **Leverage NSRDEC Energy Savings Technologies**

- **Photovoltaics**
- **Advanced Insulation**
- **LED-based Lighting**
- **Solar Shades**

- **Need for foam alternatives**

- **Force Provider, Field Hospitals**
- **Cost**
- **Safety**
- **Redeployment**

- **Quantify added value**

- **Transition plan**

- **PM Force Sustainment Systems**
- **Joint PM Collective Protection**
- **Army Medical Department**



*Solar Covers Block 60% of Radiant heat.  
Modular from 900 sf to 10,000 sf*



*Aerogel Silica Mesh  
Insulation*



*L'Garde Air Cell  
Insulation*



*Electroluminescent Lighting System*



*Shelter LED Lighting with Ambience*



*Small Tactical Airbeam Tent Deployed as  
Force Provider 150 Soldier Base Camp*



*Modular Ballistic Protection System  
(MBPS) Set Up Time, 2 min. per linear foot*



*MBPS meets Unified  
Facilities Criteria for  
Blast Over Pressure*



*BB2950 Battery charger  
for Comms and Sensors*



*QUADrant units &  
Balance of Systems  
converts DC to AC  
and stores reserves*

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**



*PowerShade (1 - 3KW)  
also blocks 90% of  
radiant heat*

UNCLASSIFIED



# Evaluation Overview



- **Goals**
  - Compare baseline energy usage to energy efficient technologies
    - Evaluate various configurations for optimization
    - Relevant environmental conditions
  - Create a comparative and comprehensive report
    - Power Usage will be primary metric – Generator and fuel usage
    - Draw conclusions on recommended shelter system configurations
- **Compare results to foam data**
- **Technologies**
  - Solar Barrier Systems:
    - Ultra Lightweight Camouflage Net System (ULCANS)
    - Advanced Solar Shades (new config)
    - Power Shade (including Photovoltaic Panels (2kW))
  - High Efficiency Lighting Systems:
    - Light Emitting Diodes (Three Sets)
    - Electroluminescent Panels
  - Advanced Insulation:
    - Aerogel Liner
    - FiFoil Insulation
    - TEMPER Insulated Liner
    - Improved Tent Liner (with solar barrier material)

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

UNCLASSIFIED



# LSA Warrior Site Today



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

UNCLASSIFIED

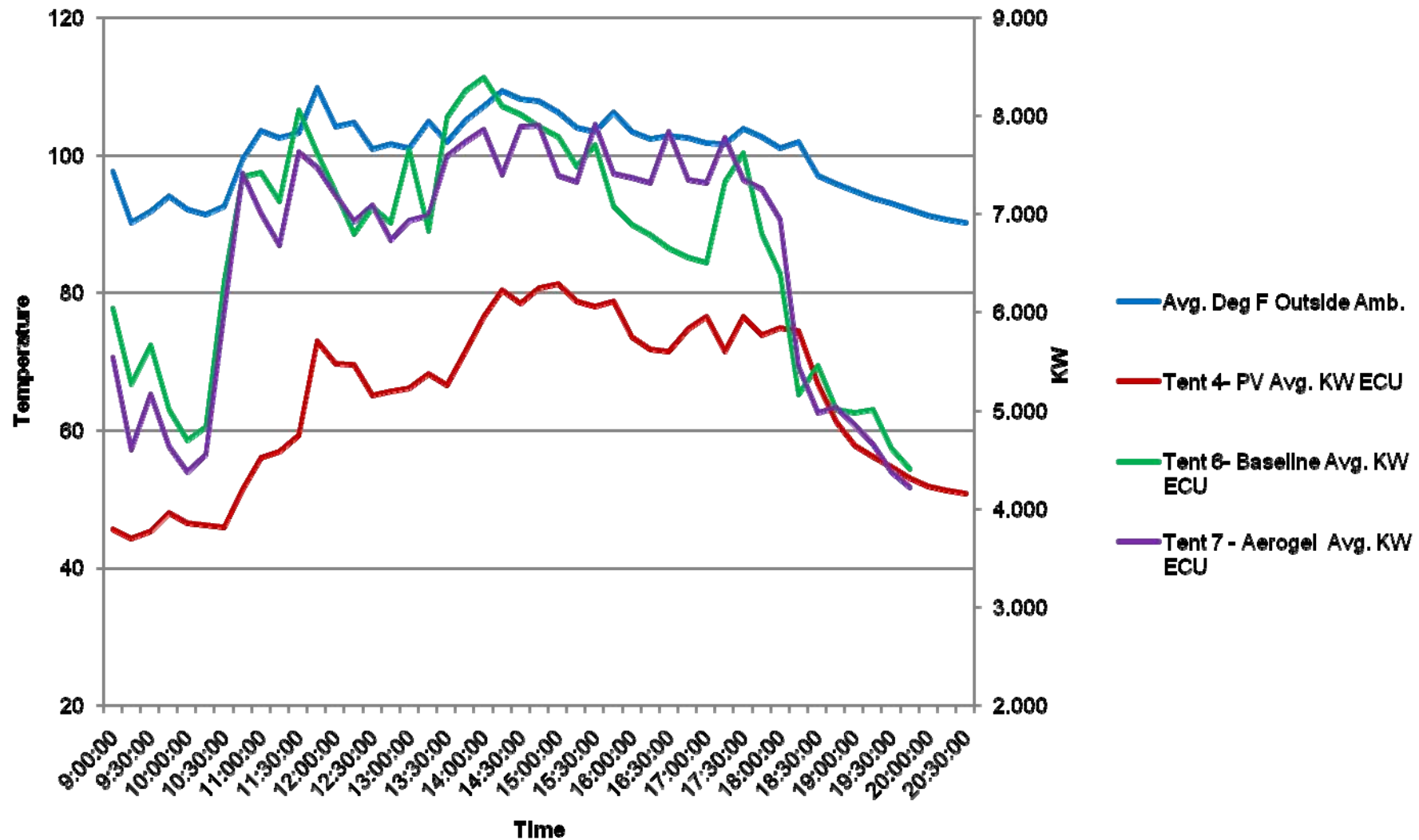




# Airbeam Tents



## All Airbeam Tents



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

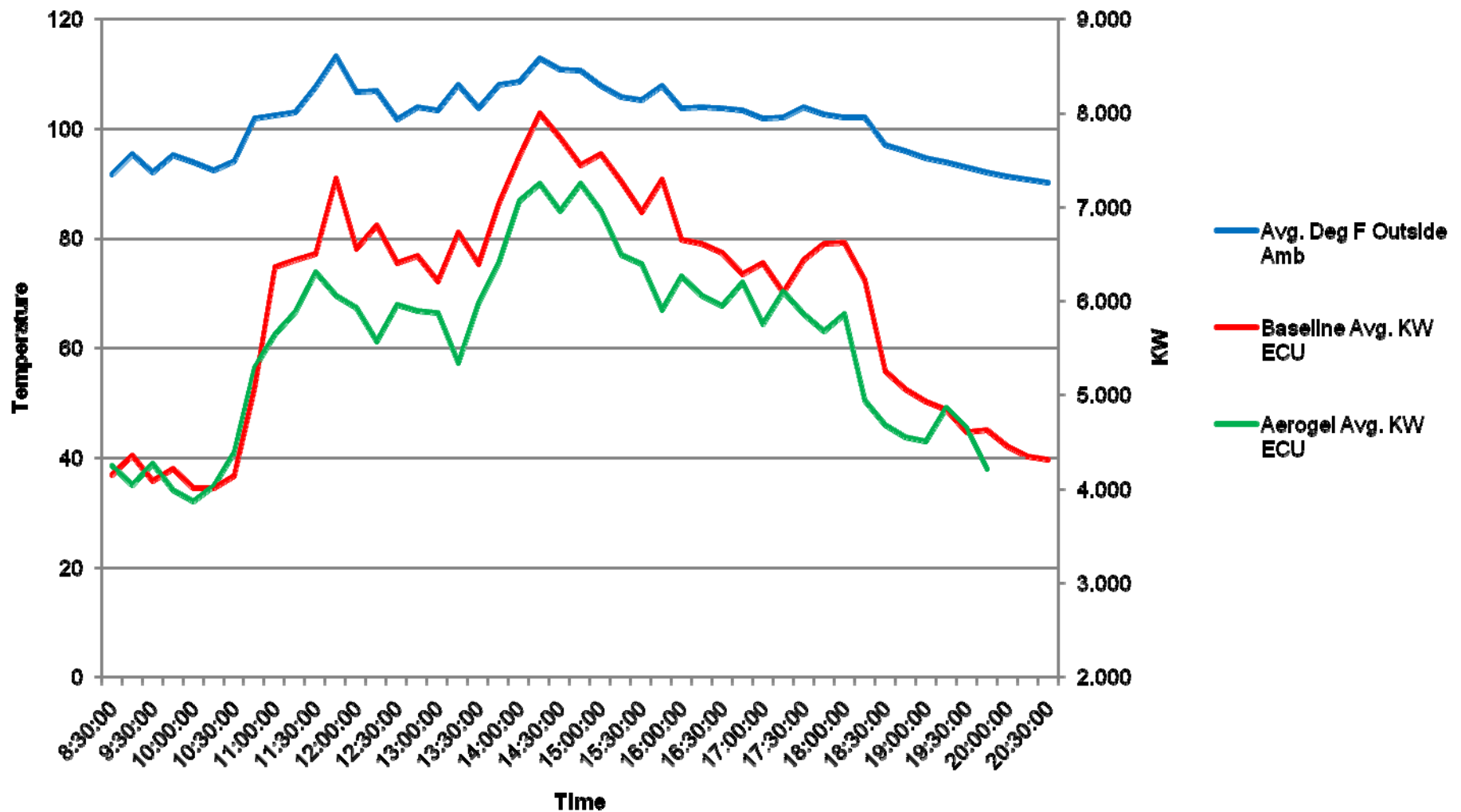
UNCLASSIFIED



# TEMPER Tents



## All TEMPER Tents



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

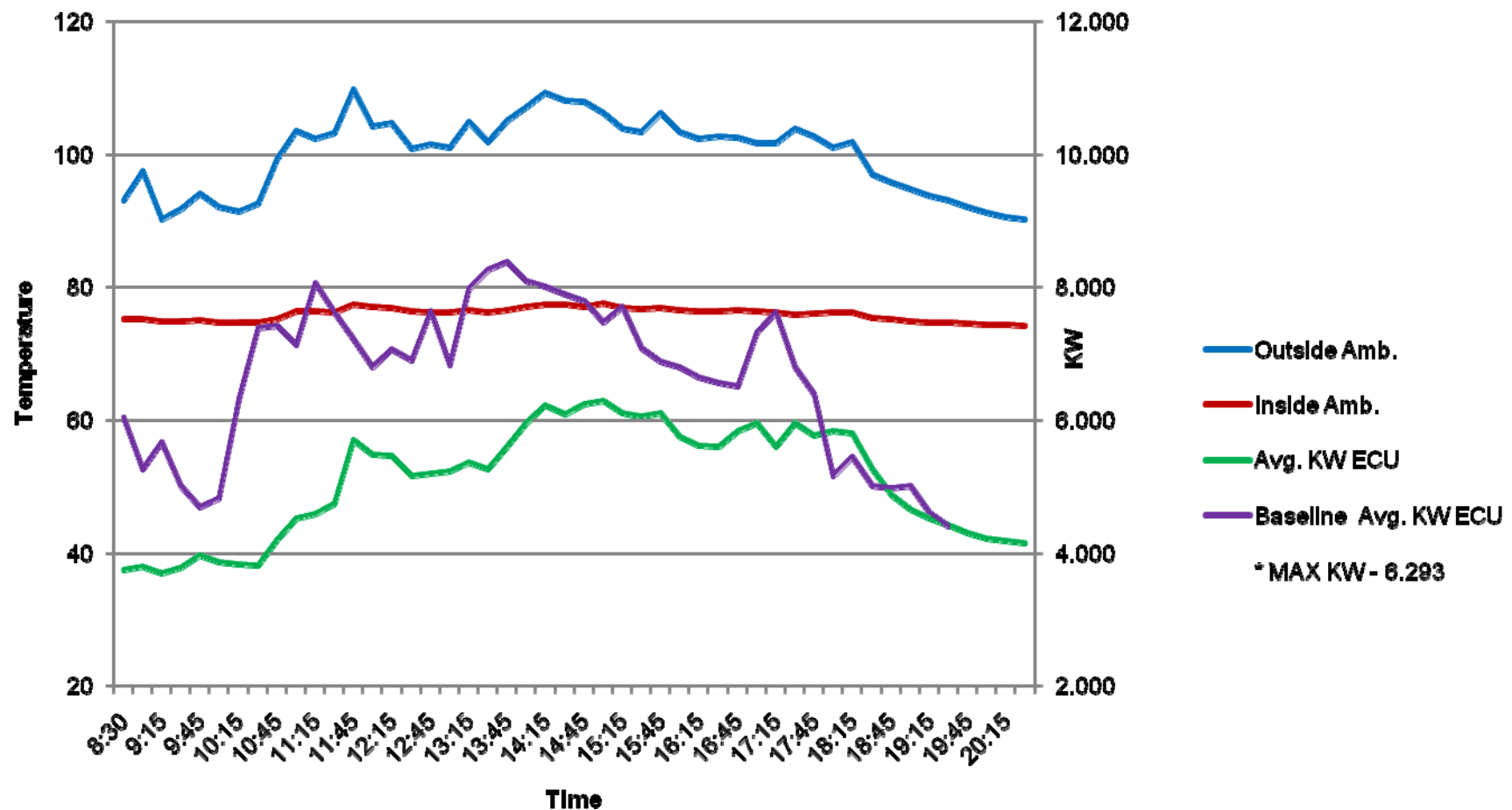
UNCLASSIFIED



# Airbeams



## Baseline vs. Airbeam w/PV



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

UNCLASSIFIED

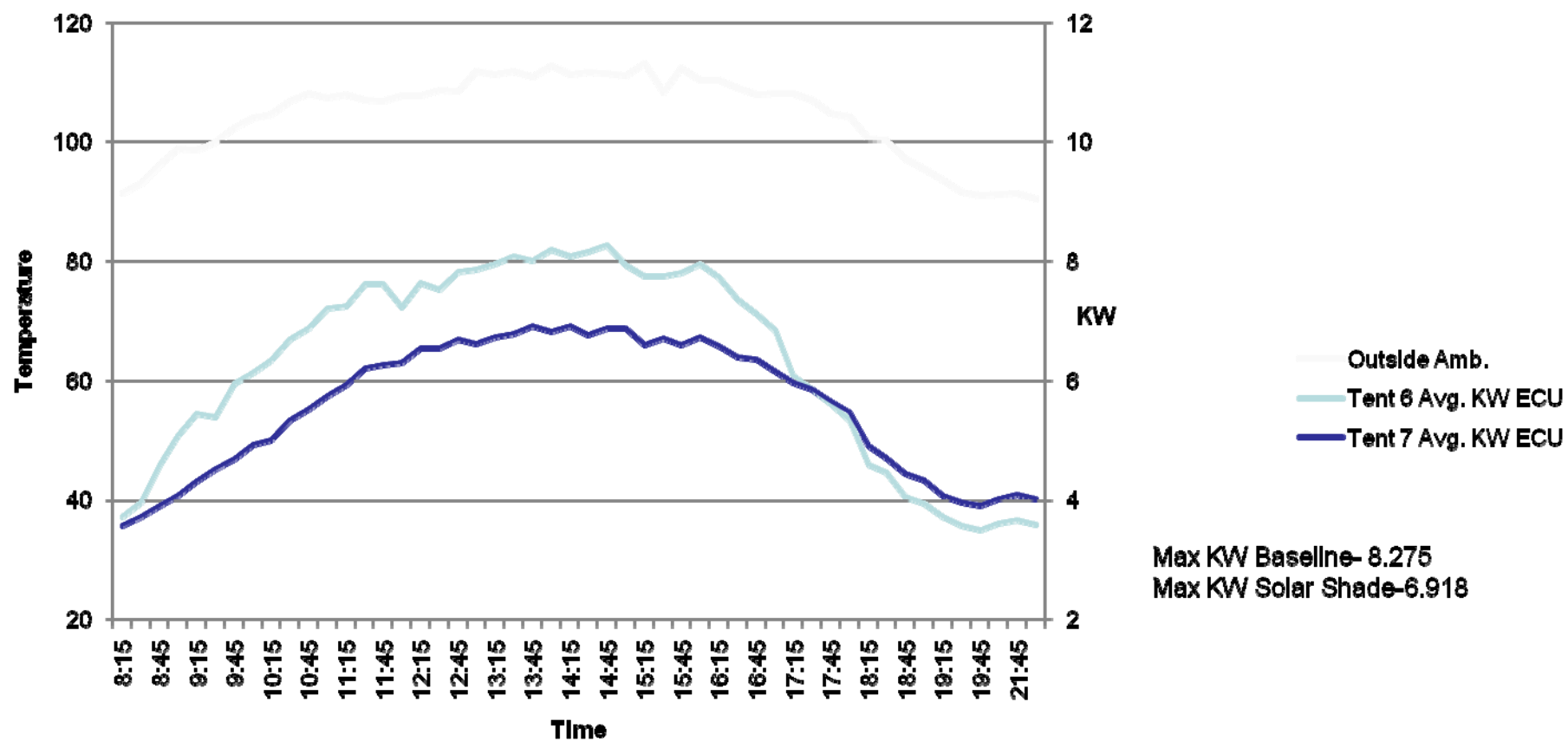




# Airbeams



## Baseline vs Solar Shade



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

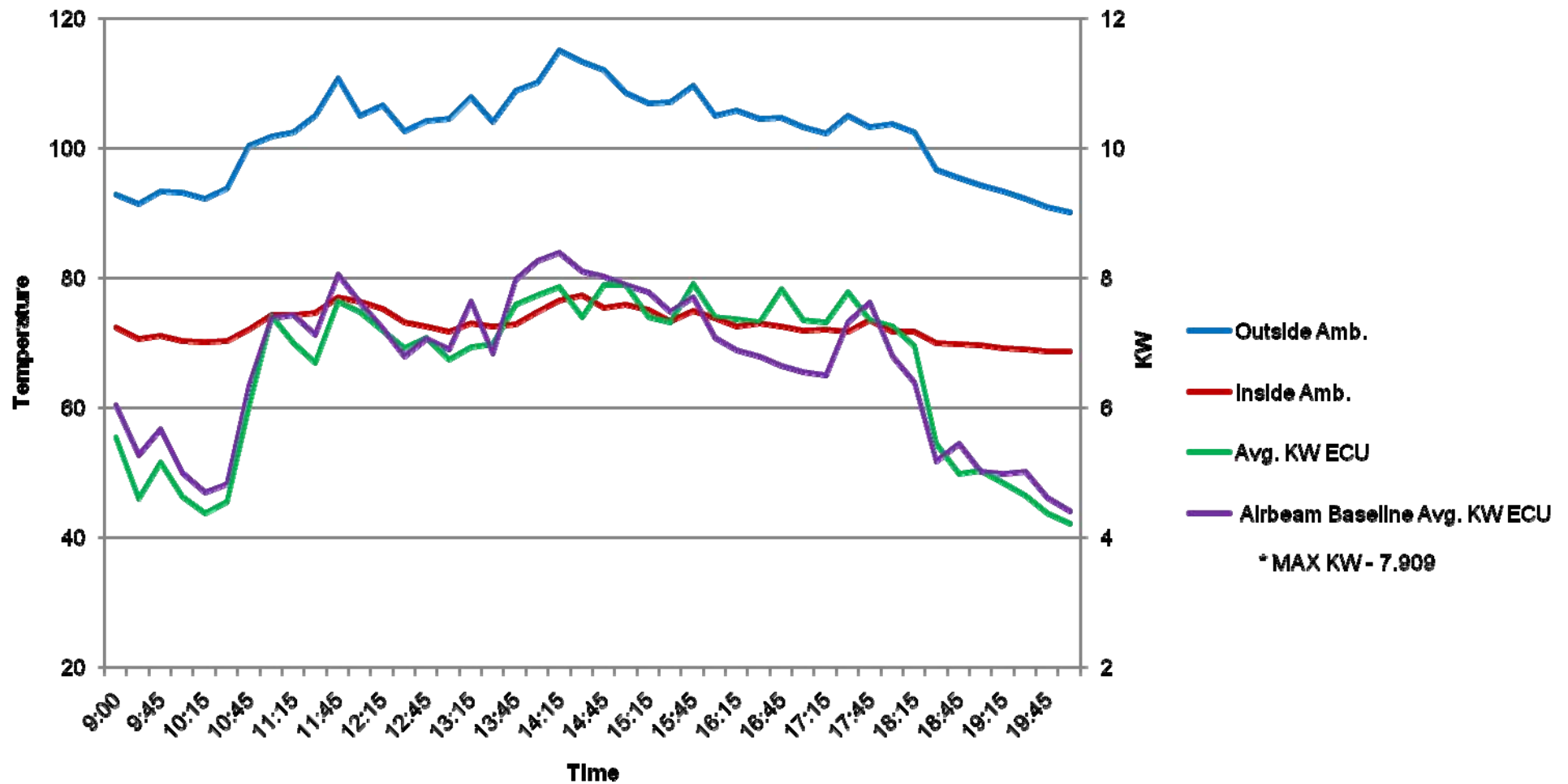
UNCLASSIFIED



# Airbeams



## Baseline vs Airbeam w/Aerogel



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

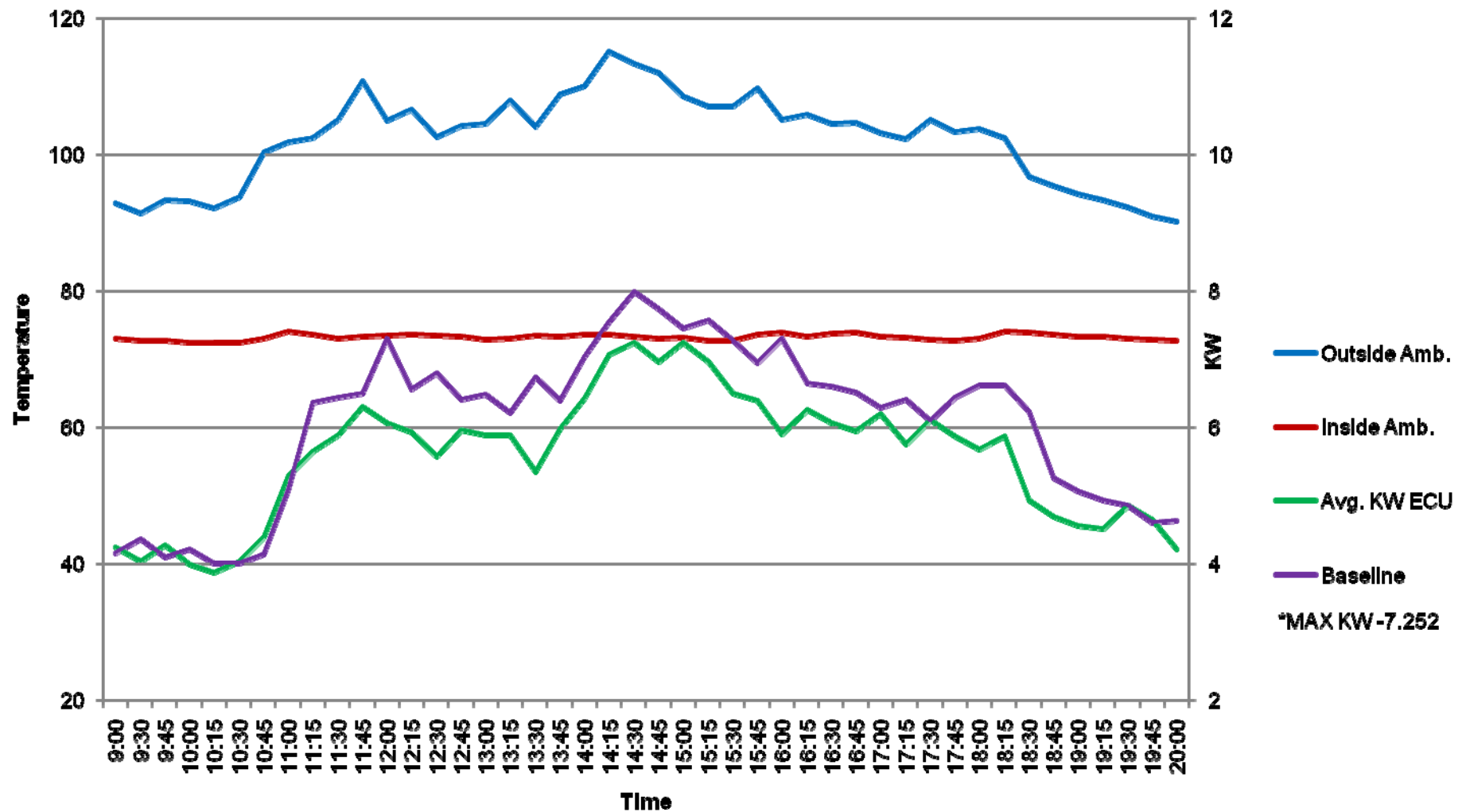
UNCLASSIFIED



# TEMPER



## Baseline vs. Temper w/Aerogel



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

UNCLASSIFIED

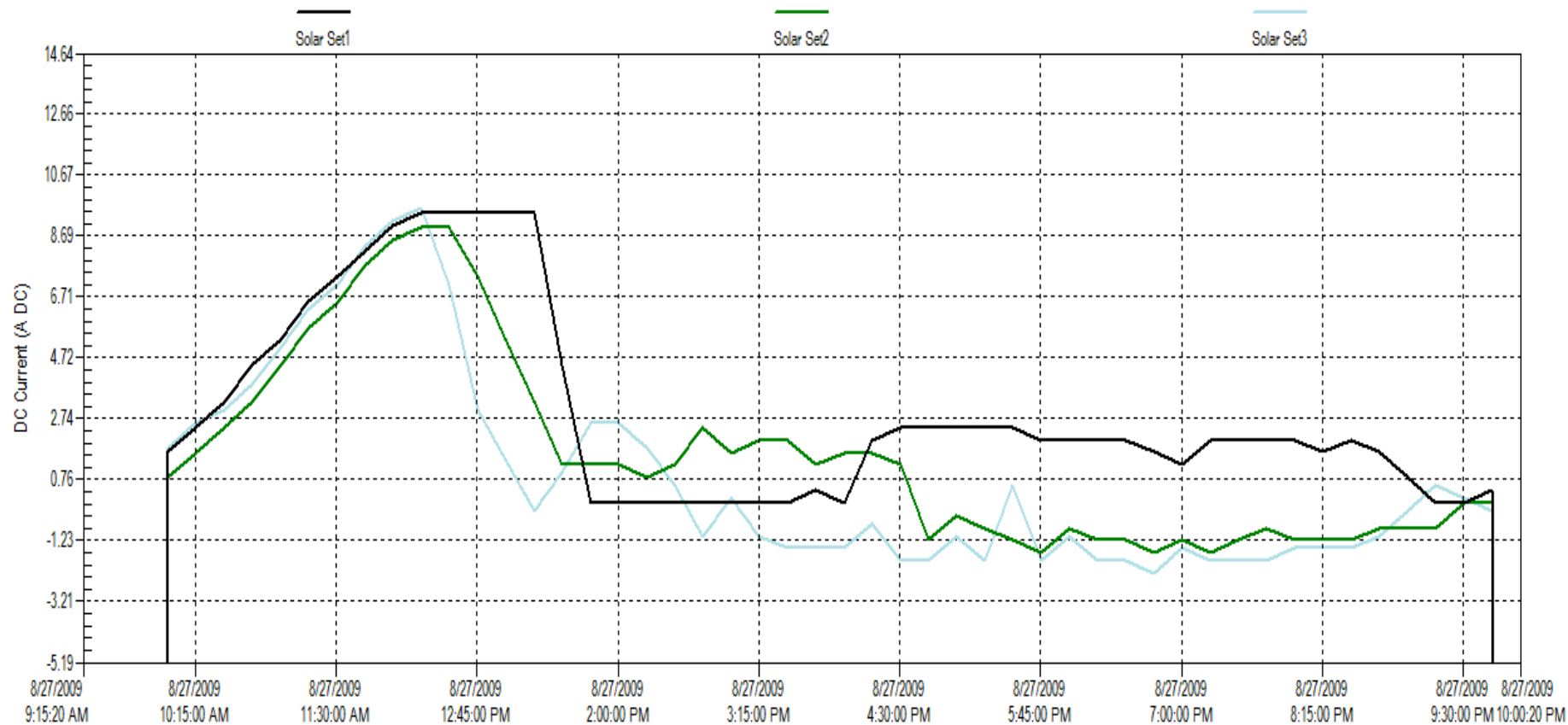


# PV Solar Production



86994 SRP-7-1.5M 0-25MA

86994 SRP-7-1.5M 0-25MA (2009-9-2 19.44.38)



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

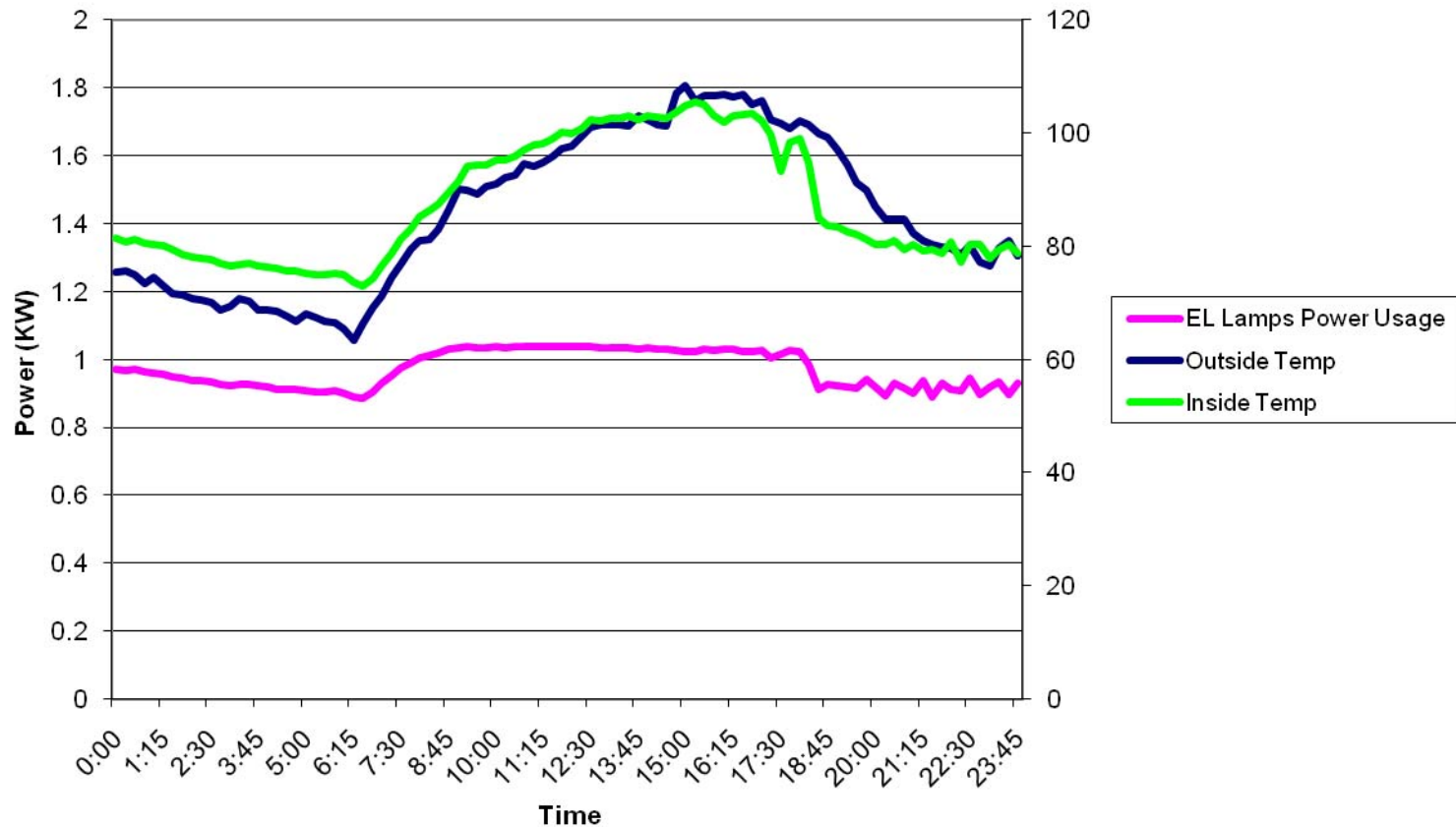
UNCLASSIFIED



# Lighting Load Vs. Temperature



Tent 3: EL Lamps Power Usage Vs. Temperature



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

UNCLASSIFIED





# Current Status



- **Seven Shelter Systems Established**
  - SOF compound at LSA Warrior at NTC
  - All seven tents now have air conditioning, data collection is being built currently, install planned for 16-20 Nov
- **NSRDEC making monthly visits to the evaluation site**
  - Download data and change out technology configurations
  - EPCC installed, ULCANS for fuel and water bladders
- **Soldier involvement is wild card; soldier feedback**
- **Next Steps**
  - Develop remainder of evaluation matrix
    - Challenge of winter
  - Changing out configurations
  - Air Force adds four tents – Nov
  - Priorities for FP are to field solar shade for airbeam and develop LED spec
    - Foam tents as baseline to aim for
  - Continue to analyze data for impacts on power and fuel usage
  - Run return on investment and life cycle cost analysis

TECHNOLOGY DRIVEN. **WARFIGHTER FOCUSED.**

UNCLASSIFIED



# Questions?



**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

Net Zero Plus JCTD:  
Evaluation of Energy  
Saving Technologies for  
Expeditionary Shelters

Brant Lagoon  
Project Manager  
NSRDEC  
Presented to JOCOTAS  
4 November 2009

UNCLASSIFIED